

WHAT IS CLAIMED IS:

- 1                    1.        A computer-implemented method for separating gingiva from a tooth,  
2   comprising:  
3                    defining a cutting surface along the gingiva; and  
4                    applying the cutting surface to the tooth to separate the gingiva from the tooth.
- 1                    2.        The method of claim 1, wherein the cutting surface is curved.
- 1                    3.        The method of claim 1, wherein the cutting surface is expressed as a  
2   function.
- 1                    4.        The method of claim 1, wherein the cutting surface is expressed as a  
2   spline function and a quadratic function.
- 1                    5.        The method of claim 1, wherein the cutting surface is expressed as a  
2   spline function and a parabolic function.
- 1                    6.        The method of claim 1, wherein the cutting surface is interactively  
2   adjusted.
- 1                    7.        The method of claim 4, wherein the interactive adjustment of the  
2   cutting surface modifies a function defining the cutting surface.
- 1                    8.        The method of claim 4, further comprising interactively highlighting  
2   the separated portion.
- 1                    9.        The method of claim 8, further comprising interactively highlighting  
2   the border of the separated portion.
- 1                    10.      The method of claim 1, wherein the cutting surface is defined by  
2   specifying a basis for the tooth.
- 1                    11.      The method of claim 1, further comprising finding a gingival line  
2   separating a tooth surface and a gingiva.
- 1                    12.      The method of claim 11, further comprising finding the high curvature  
2   location on the tooth surface.

- 1                    13.     The method of claim 11, further comprising fitting a spline to the  
2   gingival line.
- 1                    14.     The method of claim 1, wherein the cutting surface further comprises a  
2   plurality of surfaces.
- 1                    15.     The method of claim 14, wherein the root of the tooth is modeled as a  
2   parabolic surface below a gingival line.
- 1                    16.     The method of claim 14, further comprising defining an enclosing  
2   surface to enclose the crown of the tooth.
- 1                    17.     The method of claim 14, further comprising:  
2   displaying the surface specified with a plurality of nodes;  
3   adjusting one or more nodes to modify the surface; and  
4   applying the surface to separate the gingiva from the tooth.
- 1                    18.     The method of claim 17, further comprising providing a handle to  
2   adjust each orientation of the cutting shape.
- 1                    19.     The method of claim 17, wherein adjusting one or more nodes further  
2   comprises moving one or more nodes.
- 1                    20.     The method of claim 17, wherein the cutting surface is formed using a  
2   function in a cylindrical coordinate system.
- 1                    21.     A system for separating gingiva from a tooth, comprising:  
2   means for defining a cutting surface along the gingiva; and  
3   means for applying the cutting surface to the tooth to separate the gingiva  
4   from the tooth.
- 1                    22 .     A computer program, residing on a tangible storage medium, for use in  
2   separating gingiva from a computer model of a tooth, the program comprising executable  
3   instructions operable to cause a computer to:  
4   define a cutting surface along the gingiva; and  
5   apply the cutting surface to the tooth to separate the gingiva from the tooth in  
6   a single cut.

1                   23.     A computer program, residing on a tangible storage medium, for use in  
2 separating gingiva from a computer model of a tooth, the program comprising executable  
3 instructions operable to cause a computer to:

4                   define a cutting surface along the gingiva, wherein the cutting surface is  
5 expressed as a spline function and a quadratic function; and

6                   apply the cutting surface to the tooth to separate the gingiva from the tooth in  
7 a single cut.

1                   24.     A computer, comprising:

2                   a processor;

3                   a data storage device coupled to the processor, the data storage device  
4 containing code for use in separating gingiva from a computer model of a tooth, the program  
5 comprising executable instructions operable to cause a computer to:

6                   define a cutting surface along the gingiva, wherein the cutting surface is  
7 expressed as a spline function and a quadratic function and wherein the cutting surface  
8 further comprises a plurality of surfaces and wherein the root of the tooth is modeled as a  
9 parabolic surface below a gingival line; and

10                  apply the cutting surface to the tooth to separate the gingiva from the tooth.

1                   25.     The system of claim 24, further comprising instructions to define an  
2 enclosing surface to enclose the crown of the tooth.

1                   26.     A computer-implemented method for separating tooth from gingiva,  
2 comprising:

3                   defining a cutting surface along the gingiva; and

4                   applying the cutting surface to the tooth to separate the gingiva and reconstruct  
5 the root for the tooth.